Plankton

"The Wanderers"
Plankton (Greek: *planktos* = wanderer, drifter)
Small producers and consumers that drift with the currents.

May be classified by:

- How they obtain food. Autotroph or Heterotroph

- Color (Phyla based on dominant photosynthetic pigment)

- Whether they spend all or part of lives as plankton. (holoplankton vs. meroplankton)

- Size
**Phytoplankton** (Greek: *phyto* = pertaining to plants)  
Primary producers in marine ecosystems.

While coastal zones often receive large amounts of food from other zones (i.e. seaweeds drifting into the intertidal zone, rivers/streams carrying organic material to estuaries), Pelagic regions get little input of organic material from coastal regions. Therefore, Phytoplankton account for nearly all photosynthesis in the Pelagic zones.

Two most important factors affecting phytoplankton growth  
- intensity of sunlight  
- nutrient availability: phosphorus, nitrogen
Primary Production in the Pelagic Zone

**Phytoplankton** - microscopic, single-celled algae. Not true plants.
Classified in the Kingdoms Monera and Protista (Protoctista)

Make up < 1% of Earth's total biomass but account for:

- * 50% of Earth's Oxygen
- * 40% of Carbon Fixation (CO₂ uptake and conversion to C₆H₁₂O₆)

"If you can read this, thank a teacher.
If you’re breathing, thank a phytoplankton"
## Classification of Phytoplankton

<table>
<thead>
<tr>
<th>Kingdom</th>
<th>Phylum</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monera</td>
<td>Cyanobacteria</td>
<td>blue-green algae</td>
</tr>
<tr>
<td>Protoctista</td>
<td>Chlorophyta</td>
<td>green algae</td>
</tr>
<tr>
<td></td>
<td>Rhodophyta</td>
<td>red algae</td>
</tr>
<tr>
<td></td>
<td>Dinoflagellata</td>
<td>dinoflagellates</td>
</tr>
<tr>
<td></td>
<td>Phaeophyta</td>
<td>brown algae</td>
</tr>
<tr>
<td></td>
<td>Chrysophyta</td>
<td>golden algae</td>
</tr>
<tr>
<td></td>
<td>Bacillariophyta</td>
<td>diatoms</td>
</tr>
</tbody>
</table>
Types of Phytoplankton

*Diatoms*- (net plankton), coastal
- single cell or chains.
- shell made of silicon, doesn't dissolve in water, so when they die their shells sink to the bottom and pile up.

Two basic shapes:
  - Centric (circular)
  - Pennate (elongated or triangular)

*Dinoflagellates*- (net plankton), coastal
- flagella for mobility.
- prefer warm water.
- Can bloom ----> red tide
Cyanobacteria- Blue-Green Algae, offshore.

Coccolithophores- not common here.
Zooplankton (Greek: \textit{zoo} = animal)

1\textsuperscript{st} and 2\textsuperscript{nd} consumers in marine ecosystems.

Some are simple, unicellular protists (radiolaria and foraminifer) 
Some are larval stages of larger animals (holoplankton)

Can be grouped as:

\textbf{Holoplankton}- spend their entire lives as plankton.

\textbf{Meroplankton}- spend only a part of their lives as plankton.

Classification of Zooplankton

<table>
<thead>
<tr>
<th>Kingdom</th>
<th>Phylum/larva name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal (meroplankton)</td>
<td>Chordata</td>
<td>Fish</td>
</tr>
<tr>
<td></td>
<td>Nauplius</td>
<td>Barnacle</td>
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<td></td>
<td>Veliger</td>
<td>Snail</td>
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<tr>
<td></td>
<td>Zoea</td>
<td>Crab</td>
</tr>
<tr>
<td></td>
<td>Trochophore</td>
<td>Worm/snail/bivalve</td>
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<tr>
<td></td>
<td>Planula</td>
<td>Jelly</td>
</tr>
<tr>
<td>Protoctista (holoplankton)</td>
<td>Protozoa</td>
<td>Dinoflagellates</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Foraminifera</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Radiolarians</td>
</tr>
</tbody>
</table>
Planktonic larval stages (Meroplankton)

Figure 2. Some planktonic larval stages of selected organisms
Two of the more abundant holoplanktonic animals

Radiolarians - unicellular with shells made of silica (glass).

Foraminifera - have shells made of Calcium Carbonate (CaCO₃).
Zooplankton

Copepods - most abundant animal on Earth. The sinking of their fecal pellets is an important flux of organic carbon to deep sea floor.

Mixed Zooplankton

Copepod w/ egg sacs
Staying Afloat in the Pelagic

Plankton (passive floaters) adaptations to resist sinking:

1. large surface area (A) to volume (V) ratio (A/V)
   Like a parachute, the larger the surface area in relation to the volume (size) of the organism the greater the resistance to gravity and the slower the sinking
   • tiny size
     the smaller the size, the greater the A/V ratio
   • appendages and spines
     = greater surface area (= greater A/V ratio)
   • flat shapes
     = greater surface area
   • form chains
     = greater surface area

2. produce oil droplets within their cells
   = greater buoyancy

3. Flagella
   hair-like appendages used to move through liquid
**Vertical Migration**

The single largest migration on Earth happens on a daily basis!

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*Vertical Migration of Plankton Animals.* (pp. 128, 129).

Showing behaviour of a crustacean copepod (*Calanus finmarchicus*), a medusa (*Cosmetira pilonella*), and a crustacean mysid (*Leptomysis gracilis*) which lives on the bottom in the daytime.

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Catching Plankton

Weather and tides permitting, we will do a plankton tow off of the Bluefish River Bridge.